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INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 27178	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/EP 03/14676	International filing date (<i>day/month/year</i>) 19.12.2003	Priority date (<i>day/month/year</i>) 08.01.2003
International Patent Classification (IPC) or both national classification and IPC C23C14/24, C23C14/26, F27B14/10		
Applicant SINTEC KERAMIK GMBH & CO. KG et al.		

1. This International preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.
- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).
- These annexes consist of a total of 5 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the opinion
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 05.08.2004	Date of completion of this report 05.04.2005
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tlx 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Hoyer, W Telephone No. +49 89 2399-8439 

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/EP 03/14676**

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1, 3-6, 8, 9 as originally filed
2, 7 filed with telefax on 14.02.2005

Claims, Numbers

1-13 filed with telefax on 14.02.2005

Drawings, Sheets

1/3-3/3 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
☐ the language of publication of the international application (under Rule 48.3(b)).
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority in written form.
☐ furnished subsequently to this Authority in computer readable form.
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1 - 13
	No: Claims	
Inventive step (IS)	Yes: Claims	1 - 13
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1 - 13
	No: Claims	

2. Citations and explanations

see separate sheet

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EXAMINATION REPORT - SEPARATE SHEET**

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Re Item V

**Reasoned statement with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

1. Reference is made to the following documents:

- D1: WO 97/21847 A (SINTEC KERAMIK GMBH; GOETZ ULRICH (DE)) 19 June 1997 (1997-06-19)
- D2: DE 197 08 599 C (SINTEC KERAMIK GMBH) 2 April 1998 (1998-04-02)
- D3: US-A-4 089 643 (JERABEK CHARLES F ET AL) 16 May 1978 (1978-05-16)
- D4: US-A-3 598 958 (DAVEY ERNEST A ET AL) 10 August 1971 (1971-08-10)

- 1.1 D1, in the name of one of the present inventors and acknowledged in the present application, is considered as closest prior art. D1 discloses at page 5, lines 4 - 37 in connection with Figure 5 a vaporizer boat with isosceles triangular cross-section. The preferred ratio of width by height is at least 2:1 (see also claim 6 of D1). At these conditions, each of the lateral side surfaces is inevitably inclined with an angle of 45° with respect to the upper side (15). However, the most preferred boat has a height or thickness of 10 mm and a width at its upper side of 30 mm which corresponds to a ratio of width by height equal to 3:1 (cf. D1, page 5, lines 7 - 8 and 34 - 37). It is derivable from the citation that this shape gives the best results as regards the ratio of vaporization surface to heat dissipation and can be easily manufactured by simple cuts from block material.
- 1.2 The subject-matter according to claim 1 of the present application is distinguished over D1 in that the boat has a trapezoidal cross-section so that the ratio of width by height is equal to 3:1 and each of the lateral surfaces encloses an angle of 45° with the upper side of the boat. Although a ratio of width by height with at least 2:1 is encompassed by the disclosures in D1, there is no teaching in D1 to prefer an angle of 45°. It is derivable from the present application, page 2, 4th paragraph that the angle of 45° results in a higher mass which has a positive impact on the heat capacity.
- 1.3 D2, in the name of one of the present inventors, is similar to D1 and discloses at column 2, lines 10 - 36 in connection with Figure 2 a vaporizer boat (5) with isosceles

**INTERNATIONAL PRELIMINARY
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triangular cross-section. The preferred ratio of width by height is preferably least 3.5:1 (see claim 4 of D2). Also D2 does not teach lateral surfaces enclosing an angle of 45° with the upper side of the boat.

1.4 D3 and D4 do not disclose anything beyond D1.

2. According to the comments above, claims 1 - 13 meet the requirements of Art. 33(2) and (3) PCT.

between the upper side and each lateral side surface of the vaporizer boat is about 30° .

5 According to the present invention, a vaporizer boat of the present kind is provided, which shows a good and stable behavior in operation and can be manufactured at moderate manufacturing costs.

10 According to the present invention, the resistance-heated ceramic vaporizer boat is provided with an elongated vaporizer body comprising an upper side and a lower side extending parallel to each other, and comprising non-parallel plane lateral side surfaces, each of which being inclined with respect to the upper side by an angle of 45° .

15 The cross-sectional shape of the ceramic vaporizer boat according to the present invention is substantially in the form of an isosceles trapezoid, wherein the ratio between width and height is 3:1 and the length may be chosen freely.
20 Since the lateral side surfaces are disposed at an angle of 45° with respect to the upper side, the vaporizer boat as compared to vaporizer boats having a swallow triangular cross section comprises a higher mass, and it is altogether more stable in its lateral areas, with the advantage that
25 an operator does not need to react as sensitively when operating such vaporizer boats, whereby the operational costs for the facilities can be reduced by applying said vaporizer boats.

30 Further advantages of the vaporizer boat according to the present invention are that in its middle the conductive cross section of the material to be heated remains unchanged, as compared to the vaporizer boat having a rectangular cross section, so that the use of the vaporizer

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As can be seen in Fig. 1, the vaporizer boat 10, being made of homogeneous ceramic material, has a trapezoidal cross section comprising an upper side 1 and a lower side 2 being parallel to each other. The lateral side surfaces 3 are inclined, and each of them encloses an angle of 45° with the upper side 1, so that the cross section of the vaporizer body is of isosceles trapezoidal shape. In order to localize the metal to be vaporized, a cavity 4 is formed in the upper side 1 comprising the vaporizing surface, said cavity 4 extending along the longitudinal direction of the vaporizer boat 10. The ratio between the width of the upper side 1 and the height of the vaporizer boat 10 is 3:1.

According to a preferred embodiment, the upper side 1 has a width of 30 mm, whereas the lower side has a width of 10 mm and, therefore, the height of the vaporizer boat 10 is 10 mm as well. The length of the vaporizer boat 10 depends on the geometry of the facilities and typically is about 80 mm up to more than 500 mm.

As can be seen in FIG. 2 and 3, the vaporizer boat 10, at the free end portions thereof, has clamping regions 6 being formed by means of two clamping surfaces 5 being opposite to each other and being extended into the longitudinal direction of the vaporizer boat 10, wherein according to this embodiment the two lateral clamping surfaces 5 being opposite to each other extend parallel to each other and join the vaporizer body with a large radius. The length of the clamping surfaces 5 is preferably 5 mm to 20 mm, depending on the overall size of the vaporiser boat 10. The cavity 4 within the upper side 1 preferably extends in

Claims:

1. Resistance-heated ceramic vaporizer boat (10)
comprising an elongated vaporizer body made of homogeneous
5 ceramic material and having an upper side (1) and plane
lateral side surfaces (3) which are non-parallel to each
other, each of said lateral side surfaces (3) is inclined
to enclose an angle of 45° with the upper side (1), wherein
the vaporizer body has a trapezoidal cross-section so that
10 the vaporizer body has a lower side (2) which is parallel
to the upper side (1) and the ratio between the width of
the upper side (1) and the height of the vaporizer body as
measured between the upper side and the lower side (2) is
3:1.

15

2. Resistance-heated ceramic vaporizer boat (10)
according to claim 1, comprising clamping regions (6) being
formed at the free end portions of the vaporizer boat (10),
the height of which clamping regions (6) not exceeding the
20 height of the vaporizer boat (10), and the clamping regions
(6) comprising two lateral clamping surfaces (5) being
laterally opposite to each other and extending in the
longitudinal direction of the vaporizer boat (10).

25 3. Resistance-heated ceramic vaporizer boat (10)
according to claim 2, wherein the clamping surfaces (5)
extend parallel to each other, and wherein the clamping
region (6) comprising the clamping surfaces (5), the upper
side (1) and the lower side (2), has a substantially
30 rectangular cross section.

4. Resistance-heated ceramic vaporizer boat (10)
according to any of claims 1 to 3, wherein a cavity (4) is
formed in the upper side (1).

5. Resistance-heated ceramic vaporizer boat (10)
according to any of claims 1 to 4, comprising
longitudinally extending edging surfaces (12) between the
5 upper side (1) and the lateral side surfaces (3).

6. Resistance-heated ceramic vaporizer boat (10)
according to any of claims 1 to 5, wherein the end portions
at the longitudinal ends of the vaporizer body are recessed
10 at the lower side (2) thereof.

7. Resistance-heated ceramic vaporizer boat (10)
according to claim 6, wherein the thickness (d) of the
vaporizer body being measured between the upper side (1)
15 and the lower side (2) thereof, is reduced along a
transition radius (r) to a predetermined partial thickness
(t) along the end portions of the vaporizer body at the
lower side (2) of the end portions.

20 8. Resistance-heated ceramic vaporizer boat (10)
according to claim 7, wherein the ratio between the
thickness (d) of the vaporizer boat (10) and the partial
thickness (t) of the end portions thereof is 10:7.

25 9. Resistance-heated ceramic vaporizer boat (10)
according to claim 8, wherein the ratio between the length
of the vaporizer boat (10) and the length of each end
portion is 13:1.

30 10. Resistance-heated ceramic vaporizer boat (10)
according to claim 8 or 9, wherein the ratio between the
length of the vaporizer boat (10) and its width at the
upper side (1) thereof is 130:35.

11. Resistance-heated ceramic vaporizer boat (10)
according to any of claims 6 to 10, wherein the upper side
(1) of the vaporizer body is plane without a cavity.

5 12. Resistance-heated ceramic vaporizer boat (10)
according to any of claims 6 to 11, wherein the lateral
side surfaces (3) of the vaporizer body each enclose an
angle of 45° with the upper side along the whole length of
the vaporizer body inclusive of the regions of the free end
10 portions thereof.

13. Resistance-heated ceramic vaporizer boat (10)
according to claim 2 or 3, wherein the lateral distance
between the clamping surfaces (5) corresponds to the width
15 of the lower side (2) of the trapezoidal cross-section.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 03/14676

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 C23C14/24 C23C14/26 F27B14/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 C23C F27B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, COMPENDEX, INSPEC, IBM-TDB

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 97/21847 A (SINTEC KERAMIK GMBH; GOETZ ULRICH (DE)) 19 June 1997 (1997-06-19) cited in the application	1,2,4,5, 11
Y	page 3, lines 4-37; claims 4,6,8; figure 5	3,6
X	DE 197 08 599 C (SINTEC KERAMIK GMBH) 2 April 1998 (1998-04-02)	1,2,4,5, 11
Y	column 2, lines 10-36 column 5, lines 8-57; figures 2-6	3,6
Y	US 4 089 643 A (JERABEK CHARLES F ET AL) 16 May 1978 (1978-05-16) cited in the application the whole document	3
Y	US 3 598 958 A (DAVEY ERNEST A ET AL) 10 August 1971 (1971-08-10) column 2, lines 15-48	6

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *&* document member of the same patent family

Date of the actual completion of the international search

11 June 2004

Date of mailing of the international search report

21/06/2004

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 03/14676

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 9721847	A	19-06-1997	DE 19545914 C1 AT 179463 T AU 1189597 A WO 9721847 A1 DE 59601792 D1 EP 0865512 A1	07-11-1996 15-05-1999 03-07-1997 19-06-1997 02-06-1999 23-09-1998
DE 19708599	C	02-04-1998	DE 19708599 C1	02-04-1998
US 4089643	A	16-05-1978	NONE	
US 3598958	A	10-08-1971	NONE	

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